

**Patent Claims:**

1. Permeable composite based on at least one perforated and permeable carrier, which contains on at least one side of the carrier and inside the carrier at least one inorganic component, which essentially contains at least one compound consisting of a metal, a metalloid or a composition metal with at least one element from group III to VII of the periodic system.
2. Permeable composite, which is obtained by the application of a suspension, which contains at least one inorganic component containing a compound of at least one metal, a metalloid or a composition metal with at least one element from group III to VII of the periodic system, and a sol on at least one perforated and permeable carrier where the suspension containing at least one inorganic component is stabilized onto or into or onto and into the carrier by being heated at least once.
3. Composite according to at least one of claims 1 or 2, wherein the composite is permeable for gases, solids or liquids.
4. Composite according to at least one of the claims 1 to 3, wherein the composite is permeable for particles with a size of 0.5 nm to 10  $\mu\text{m}$ .
5. Composite according to at least one of claims 1 to 4, wherein the perforated and permeable carrier contains gaps with a size of 0.02 to 500  $\mu\text{m}$ .
6. Composite according to at least one of claims 1 to 5, wherein the carrier contains at least one of the following materials: carbon, metals, alloys, glass, ceramic materials, minerals, plastics, amorphous substances, natural products, composites or at least one combination of these materials.
7. Composite according to at least one of claims 1 to 6, wherein the carrier was modified with at least one of the following processes: thermal, mechanical and chemical treatment or a combination of these treatment processes.

8. Composite, according to at least one of claims 1 to 7, wherein the carrier contains at least one metal or one natural fiber or one plastic and has been modified according to at least one mechanical deformation technology such as drawing, swaging, milling, stretching or forging.
9. Composite according to at least one of claims 1 to 8, wherein the carrier contains at least woven or felted or ceramically bound fibers or at least sintered spheres or particles.
10. Composite according to at least one of claims 1 to 9, wherein the carrier is perforated.
11. Composite according to at least one of claims 1 to 10, wherein the permeable carrier has been made permeable by laser or ion beam treatment.
12. Composite according to at least one of claims 1 to 11, wherein the carrier contains fibers from at least one of the following materials: carbon, glass, metals, alloys, ceramic materials, minerals, plastics, amorphous substances, natural products, composites or at least one combination of these materials.
13. Composite according to at least one of claims 1 to 12, wherein the carrier contains at least woven fibers made from metal or alloys.
14. Composite according to at least one of claims 1 to 13, wherein the carrier contains at least one mesh made from steel.
15. Composite according to at least one of claims 1 to 14, wherein the carrier contains at least one mesh with a mesh width of 5 to 500  $\mu\text{m}$ .
16. Composite according to at least one of claims 1 to 15, wherein the carrier contains at least one expanded metal with a mesh width of 5 to 500  $\mu\text{m}$ .
17. Composite according to at least one of claims 1 to 16, wherein the carrier contains a

sintered metal, a sintered glass or a metallic fleece with a pore width of 0.1 to 500  $\mu\text{m}$ .

18. Composite according to at least one of claims 1 to 17, wherein the carrier contains at least aluminum, silicon, cobalt, manganese, zinc, vanadium, molybdenum, indium, lead, bismuth, silver, gold, nickel, copper, iron, titanium, platinum, stainless steel, steel or brass or an alloy of these materials or a material coated with Au, Ag, Pb, Ti, Ni, Cr, Pt, Pd, Rh, Ru and/or Ti.

19. Composite according to at least one of claims 1 to 18, wherein an inorganic component, which contains at least one compound containing at least one metal, metalloid or composition metal with at least one element from group III to VII of the periodic system or at least one mixture of these compounds, contains at least one compound of the transition element groups and of the elements of group III to V of the periodic system or at least one compound of the transition element groups or of the elements of group III to V of the periodic system, whereby the compounds have a particle size of 0.001 to 25  $\mu\text{m}$ .

20. Composite according to at least one of claims 1 to 19, wherein the one compound, which consists of at least one metal, at least one metalloid or at least one composition metal with at least one element from group III to VII of the periodic system or a mixture of inorganic components containing these compounds, contains at least one compound of an element from the transition element groups III to VIII or at least one element from group III to V of the periodic system with at least one of the elements Te, Se, S, O, Sb, As, P, N, Ge, Si, C, Ga, Al or B or at least one compound of an element from the transitional element groups III to VIII and at least one element from group III to V of the periodic system with at least one of the elements Te, Se, S, O, Sb, As, P, N, Ge, Si, C, Ga, Al or B or a mixture of these compounds.

21. Composite according to claim 20, wherein the inorganic component contains at least one compound containing at least one of the elements Sc, Y, Ti, Zr, Nb, V, Cr, Mo, W, Mn, Fe, Co, B, Al, In, Tl, Si, Ge, Sn, Pb, Sb or Bi with at least one of the elements Te, Se, S, O, Sb, As, P, N, C, or Ga or at least one of these elements.

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22. Composite according to at least one of claims 1 to 21, wherein the inorganic component contains aluminosilicate, aluminum phosphate, zeolite or partially substituted zeolite.
23. Composite according to at least one of claims 1 to 22, wherein the inorganic component contains amorphous microporous mixed oxides that can contain up to 20 % non-hydrolyzable organic compounds.
24. Composite according to at least one of claims 1 to 23, wherein the composite contains at least two particle size fractions of at least one inorganic component.
25. Composite according to claim 24, wherein the particle size fraction in the composite contains a particle size ratio of 1:1 to 1:100.
26. Composite according to at least one of claims 24 or 25, wherein the composite contains a quantitative proportion of particle size fraction of between 0.01 to 1 and 1 to 0.01.
27. Composite according to at least one of claims 1 to 26, wherein the permeability of the composite can be limited to particles of a certain maximum size by the particle size of the inorganic component used.
28. Composite according to at least one of claims 1 to 27, wherein the suspension containing at least one inorganic component contains at least one liquid from the following: water, alcohol, and acid or a combination of these liquids.
29. Composite according to at least one of claims 1 to 28, wherein the composite is flexible.
30. Composite according to claim 29, wherein the composite is flexible to a smallest radius of up to 1 mm.
31. Process of preparing a composite as claimed in one of claims 1 to 30, wherein at least one suspension, which contains at least one inorganic component consisting of at least one compound of at least one metal, one metalloid or one composition metal with at least one

of the elements from group III to VII of the periodic system, and a sol is applied to at least one perforated and permeable carrier, and wherein the suspension is stabilized on or in or on and in the carrier material by being heated at least once

5 32. Process according to claim 31, wherein the suspension is applied onto or into or onto and into at least one carrier by stamping on, pressing on or in, rolling on, applying with a blade or brush, dipping, spraying, or pouring.

10 33. Process according to at least one of claims 31 or 32, wherein a perforated and permeable carrier is used that contains one of the following materials: carbon, metals, alloys, glass, ceramic material, minerals, plastics, amorphous substances, natural products, composites or at least one combination of these materials.

15 34. Process according to at least one of claims 31 to 33, wherein the suspension that contains at least one inorganic component and at least one metallic oxide sol, at least one metalloid oxide sol or at least one composition metallic oxide sol or a mixture of these sols is produced by suspending at least one inorganic component in at least one of these sols.

20 35. Process according to at least one of claims 31 to 34, wherein the sols are obtained by hydrolyzing at least one metallic compound, at least one metalloid compound or at least one composition metallic compound with one liquid, one gas or one solid.

25 36. Process according to claim 35, wherein as a liquid, gas or solid water, water vapor, ice, alcohol or an acid or a combination of these compounds is used for the hydrolysis of the metallic compound.

30 37. Process according to at least one of claims 35 or 36, wherein the compound to be hydrolyzed is placed in alcohol or in an acid or a combination of these liquids before hydrolysis.

38. Process according to at least one of claims 35 to 37, wherein at least one metal nitrate, metal chloride, metal carbonate, one metal alcoholate compound or at least one metalloid

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- 47 Process according to claim 46, wherein the oxides are chosen from oxides from the elements Sc, Y, Ti, Zr, V, Cr, Nb, Mo, W, Mn, Fe, Ce, Co, B, Al, In, Tl, Si, Ge, Sn, Pb and Bi.
- 48 Process according to at least one of claims 44 to 47, wherein the percentage by mass of the suspended components is 0.1 to 500 times the amount of hydrolyzed compound used.
- 49 Process according to at least one of claims 31 to 48, wherein the suspension on or in or on and in the carrier is stabilized by heating the composite to between 50 and 1000 °C.
- 50 Process according to claim 49, wherein the composite is subjected to a temperature of between 50 and 100 °C for 10 minutes to 5 hours.
- 51 Process according to claim 49, wherein the composite is subjected to a temperature of between 100 and 800 °C for 1 second to 10 minutes.
- 52 Process according to at least one of claims 49 to 51, wherein heating is done by means of warmed air, hot air, infrared radiation, microwave radiation, or electrically generated heat.
- 53 Process according to at least one of claims 49 to 51, wherein heating is done by means of using the carrier material as electric resistance heating.
- 54 Process according to at least one of claims 31 to 53, wherein stabilization of the suspension is obtained by applying the suspension onto or into or onto and into a preheated carrier.
- 55 Process according to at least one of claims 31 to 54, wherein at least one carrier is rolled from a roll and - at a speed of 1 m/h to 1 m/s - runs through at least one device that applies the suspension onto or into or onto and into the carrier and through at least one other device that enables the suspension to be stabilized onto or into or onto and into the carrier by heating, and wherein the composite produced in this way is rolled onto a second

alcoholate compound is hydrolyzed.

39. Process according to claim 38, wherein at least one metal alcoholate compound or at least one metalloid alcoholate compound from the alcoholate compounds of the elements Ti, Zr, Al, Si, Sn, Ce and Y or at least one metal nitrate, metal carbonate or metal halogenide from the metallic salts from the elements Ti, Zr, Al, Si, Sn, Ce and Y is hydrolyzed.
40. Process according to at least one of claims 31 to 39, wherein the hydrolysis of the compounds to be hydrolyzed is carried out with at least half the molar ratio of water, in relation to the hydrolyzable group of the hydrolyzable compound.
41. Process according to at least one of claims 31 to 40, wherein the hydrolyzed compound is treated with at least one organic or inorganic acid
42. Process according to claim 41, wherein the organic or inorganic acid has a concentration of 10 to 60 %.
43. Process according to at least one of claims 41 or 42, wherein the hydrolyzed compound is treated with at least one mineral acid from the following: azotic acid, sulfuric acid, perchloric acid and hydrochloric acid or a combination of these acids
44. Process according to at least one of claims 31 to 43, wherein at least one inorganic component with a particle size of 1 to 10000 nm is suspended in a sol.
45. Process according to claim 44, wherein an inorganic component is suspended that contains at least one compound from the following: metallic compounds, metalloid compounds, composition metallic compounds or metallic mixture compounds with at least one element from group III to VII of the periodic system, or at least one mixture of these compounds.
46. Process according to at least one of claims 44 or 45, wherein an inorganic component is suspended that contains at least one compound from the oxides of the elements of the transition element groups or the elements from group III to V of the periodic system.

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56. Process according to at least one of claims 31 to 55, wherein an unsintered ceramic or inorganic layer is applied to a carrier and stabilized onto this carrier by being heated.

57. Use of a composite as claimed in one of claims 1 to 30 as a filter for the separation of material mixtures.

58. Use of a composite as claimed in one of claims 1 to 30 as a filter for the separation of liquid mixtures, gas mixtures, mixtures containing at least one liquid and at least one gas, mixtures containing at least one solid and at least one liquid, and mixtures containing at least one gas and at least one solid or at least one liquid or one gas

59. Use of a composite as claimed in one of claims 1 to 30 as a filter in pressurized separation processes.

60. Use of a composite as claimed in one of claims 1 to 30 as a membrane for micro-filtration, ultra-filtration or nano-filtration.

61. Use of a composite as claimed in one of claims 1 to 30 in catalytic processes

62. Use of a composite as claimed in one of claims 1 to 30 as a form-selective membrane

63. Use of a composite as claimed in one of claims 1 to 30 as a form-selective membrane in a wound module.

64. Use of a composite as claimed in one of claims 1 to 30 as a form-selective membrane in a flat module.

65. Use of a composite as claimed in one of claims 1 to 30 as a diaphragm or battery separator.

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